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**Chen et al.**

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(54) **SIGNAL SPLITTER**

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(57) **ABSTRACT**

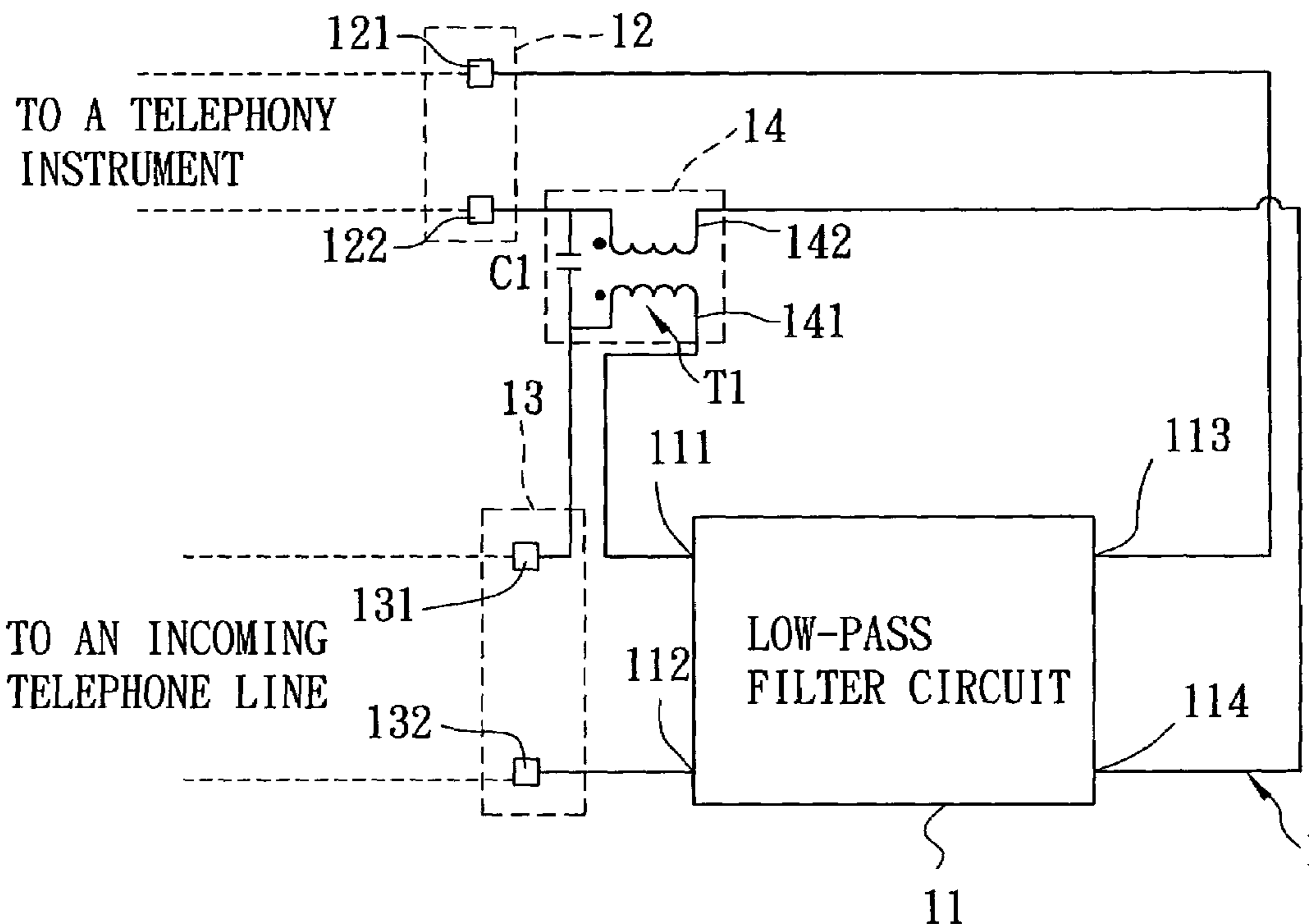
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A signal splitter includes a low-pass filter circuit for permitting a low-frequency component of an incoming signal in an incoming telephone line coupled to a first connecting port to pass therethrough to a second connecting port, and a coupling circuit including a capacitor coupled between a first terminal of the first connecting port and a second terminal of the second connecting port, and a coupling transformer having a primary winding that interconnects the first terminal of the first connecting port and a first input end of the low-pass filter circuit, and a secondary winding that interconnects the second terminal of the second connecting port and a second output end of the low-pass filter circuit.

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*H04B 3/28* (2006.01)  
*H03H 7/46* (2006.01)  
*H03H 7/01* (2006.01)  
(52) **U.S. Cl.** ..... 333/132; 333/12; 333/24 R; 333/177  
(58) **Field of Classification Search** ..... 333/12, 333/24 R, 132, 177  
See application file for complete search history.

**1 Claim, 2 Drawing Sheets**



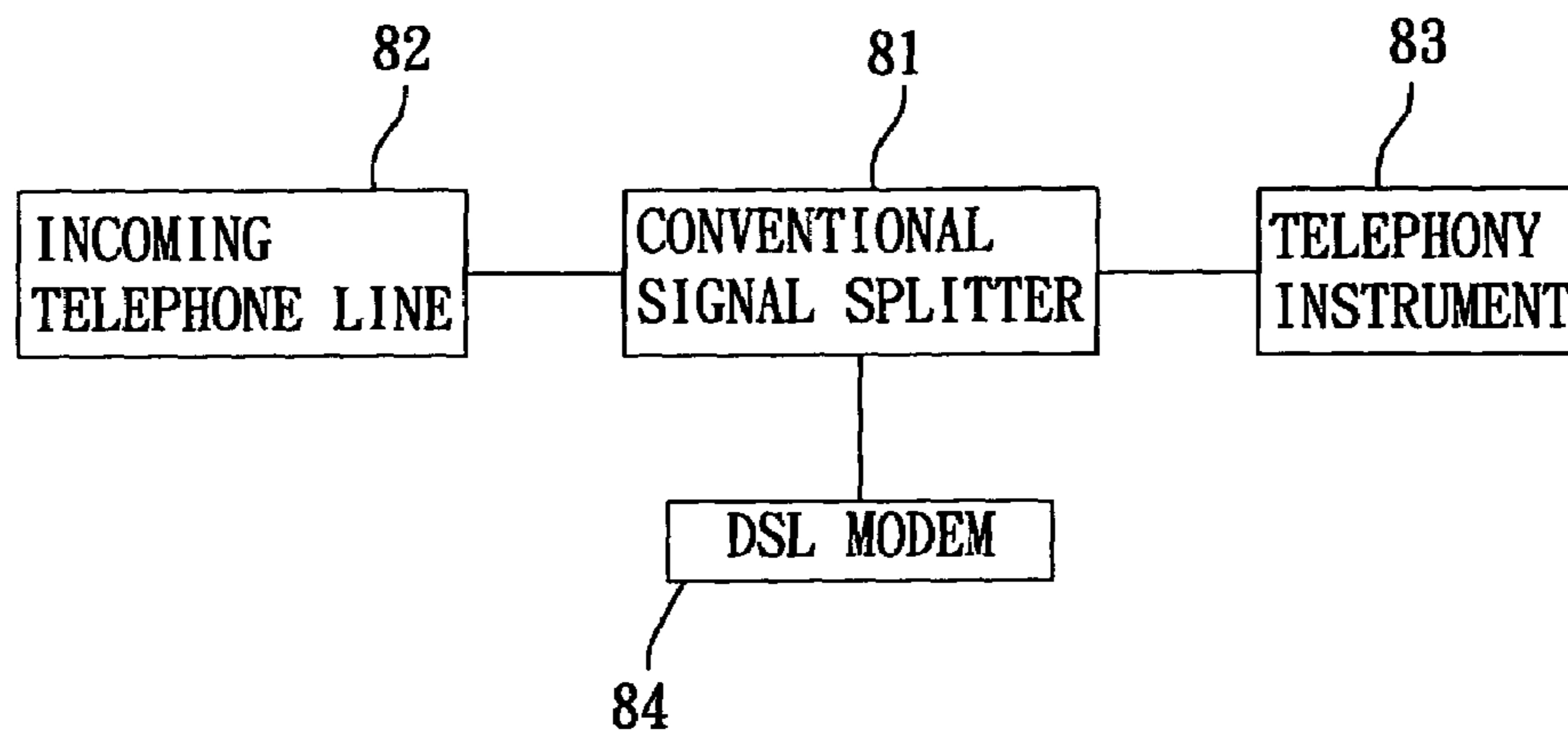


FIG. 1  
PRIOR ART

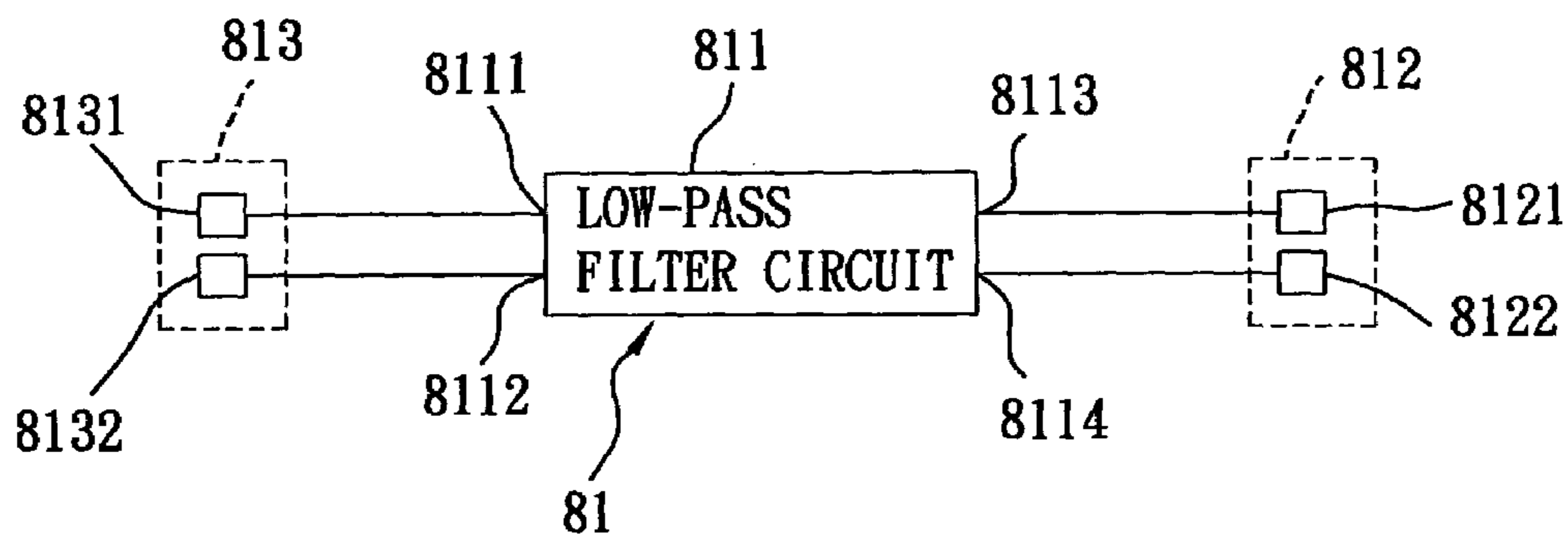


FIG. 2  
PRIOR ART

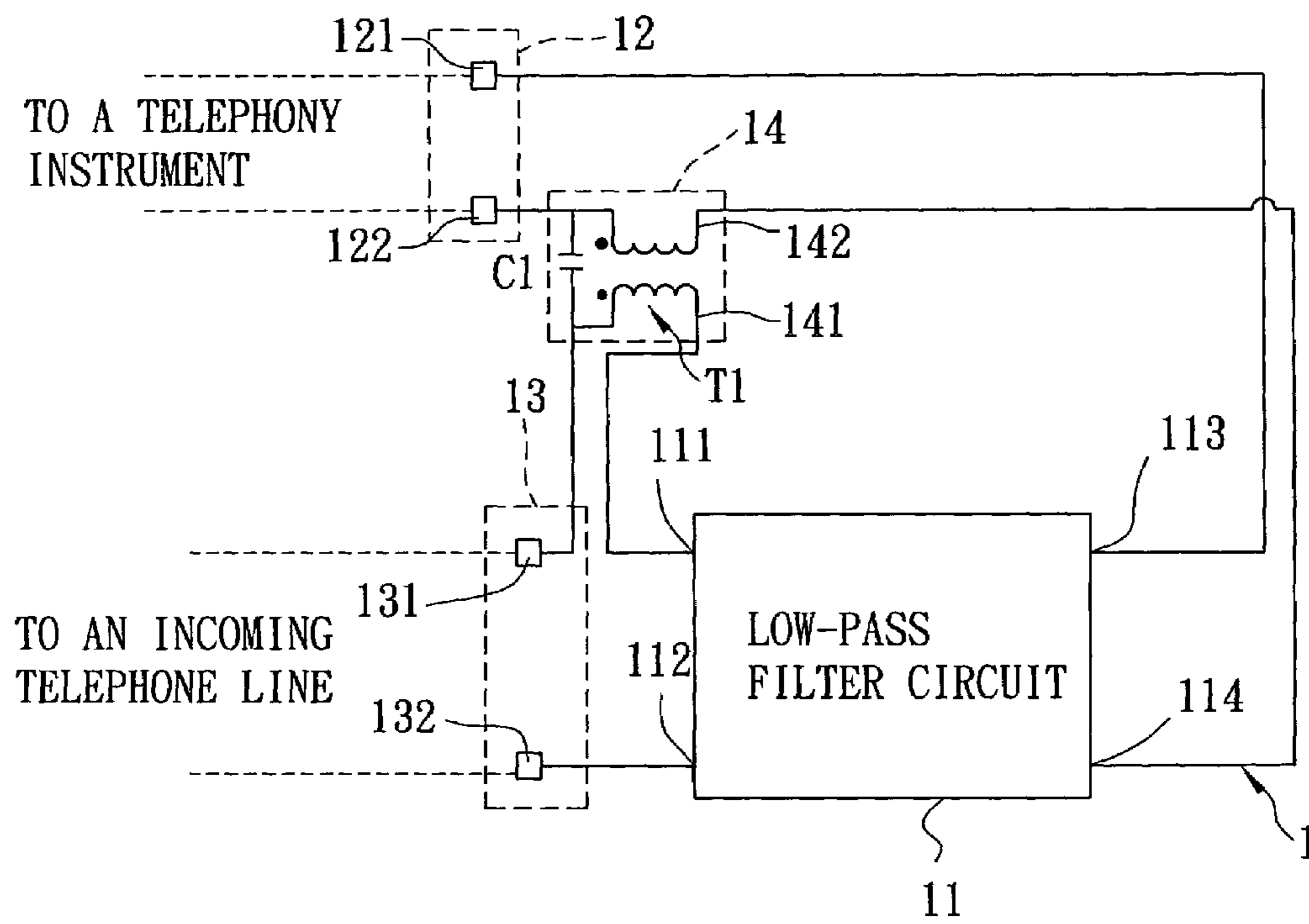


FIG. 3

## 1

## SIGNAL SPLITTER

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

The invention relates to a signal splitter, more particularly to a signal splitter capable of reducing cross-talk phenomenon.

## 2. Description of the Related Art

FIGS. 1 and 2 illustrate a conventional signal splitter **81** that can be coupled among an incoming telephone line **82**, a telephony instrument **83** and a digital subscriber line (DSL) modem **84**, and that includes a first connecting port **813**, a second connecting port **812** and a low-pass filter circuit **811**. The first connecting port **813** is to be coupled to the incoming telephone line **82**, and has first and second terminals **8131**, **8132**. The second connecting port **812** is to be coupled to the telephony instrument **83**, and has first and second terminals **8121**, **8122**. The low-pass filter circuit **811** has first and second input ends **8111**, **8112** connected electrically and respectively to the first and second terminals **8131**, **8132** of the first connecting port **813**, and first and second output ends **8113**, **8114** connected electrically and respectively to the first and second terminals **8121**, **8122** of the second connecting port **812**. The low-pass filter circuit **811** is capable of permitting a low-frequency component of an incoming signal in the incoming telephone line **82** to pass therethrough to the second connecting port **812** in a known manner.

It is noted that, since the first connecting port **813** is disposed adjacent to the second connecting port **812** due to physical restrictions imposed by the environment of application, a high-frequency noise signal is easily induced by a high-frequency component of the incoming signal in the incoming telephone line **82** upon the second connecting port **812**. Due to the induced high-frequency noise signal, cross-talk phenomenon is unavoidable.

## SUMMARY OF THE INVENTION

Therefore, the object of the present invention is to provide a signal splitter that can overcome the aforesaid drawback of the prior art.

According to the present invention, a signal splitter comprises:

a first connecting port adapted to be coupled to an incoming telephone line and having first and second terminals;

a second connecting port adapted to be coupled to a telephony instrument and having first and second terminals;

a low-pass filter circuit having first and second input ends connected electrically and respectively to the first and second terminals of the first connecting port, and first and second output ends connected electrically and respectively to the first and second terminals of the second connecting port, the low-pass filter circuit being capable of permitting a low-frequency component of an incoming signal in the incoming telephone line to pass therethrough to the second connecting port; and

a coupling circuit including

a coupling transformer having a primary winding that interconnects the first terminal of the first connecting port and the first input end of the low-pass filter circuit, and a secondary winding that interconnects the second terminal of the second connecting port and the second output end of the low-pass filter circuit, and

a capacitor coupled between the first terminal of the first connecting port and the second terminal of the second connecting port.

## 2

The coupling circuit is operable to generate a coupling signal at the second connecting port to cancel a high-frequency noise signal induced by a high-frequency component of the incoming signal in the incoming telephone line upon the second connecting port.

## BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiment with reference to the accompanying drawings, of which:

FIG. 1 is a schematic circuit block diagram illustrating a connecting relationship of a conventional signal splitter with an incoming telephone line, a telephony instrument and a DSL modem;

FIG. 2 is a schematic circuit block diagram of the conventional signal splitter; and

FIG. 3 is a schematic circuit block diagram illustrating the preferred embodiment of a signal splitter according to the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 3, the preferred embodiment of a signal splitter **1** according to the present invention is shown to include a first connecting port **13**, a second connecting port **12**, a low-pass filter circuit **11**, and a coupling circuit **14**.

The first connecting port **13** is adapted to be coupled to an incoming telephone line, and has first and second terminals **131**, **132**.

The second connecting port **12** is adapted to be coupled to a telephony instrument, and has first and second terminals **121**, **122**.

The low-pass filter circuit **11** has first and second input ends **111**, **112** connected electrically and respectively to the first and second terminals **131**, **132** of the first connecting port **13**, and first and second output ends **113**, **114** connected electrically and respectively to the first and second terminals **121**, **122** of the second connecting port **12**. The low-pass filter circuit **11** is capable of permitting a low-frequency component of an incoming signal in the incoming telephone line to pass therethrough to the second connecting port **12** in a known manner.

Since the feature of the invention does not reside in the configuration of the low-pass filter circuit **11**, which is conventional, details of the same are omitted herein for the sake of brevity.

The coupling circuit **14** includes a coupling transformer (**T1**) and a capacitor (**C1**). In this embodiment, the coupling transformer (**T1**) includes a common core (not shown), a primary winding **141** that is wound on the common core and that interconnects the first terminal **131** of the first connecting port **13** and the first input end **111** of the low-pass filter circuit **11**, and a secondary winding **142** that is wound on the common core and that interconnects the second terminal **122** of the second connecting port **12** and the second output end **114** of the low-pass filter circuit **11**. As such, a phase difference between a signal passing through the primary winding **141** and a signal passing through the secondary winding **142** is 180°. The capacitor (**C1**) is coupled between the first terminal **131** of the first connecting port **13** and the second terminal **122** of the second connecting port **12**.

The coupling circuit **14** is operable to generate a coupling signal at the second connecting port **12** based on a high-frequency component of the incoming signal in the incoming

3

telephone line. At the same time, a high-frequency noise signal is induced by the high-frequency component of the incoming signal in the incoming telephone line upon the second connecting port **12**. Since the coupling signal generated by the coupling circuit **14** has a magnitude substantially equal to that of the high-frequency noise signal induced upon the second connecting port **12**, and since the phase difference between the coupling signal and the high-frequency noise signal is  $180^\circ$ , the high-frequency noise signal is cancelled by the coupling signal, thereby minimizing the effect of cross-talk phenomenon.

The signal splitter **1** of this invention further includes a modem interface (not shown) for coupling with a DSL modem, such as an Asymmetric Digital Subscriber Line (ADSL) modem, an Integrated Digital Subscriber Line (IDSL) modem, a High-bit-rate Digital Subscriber Line (HDSL) modem, a Single-pair Digital Subscriber Line (SDSL) modem, a Very High Data Rate Subscriber Line (VDSL) modem, etc. The modem interface permits the high-frequency component of the incoming signal in the incoming telephone line to pass therethrough to the DSL modem. Since the feature of the invention does not reside in the configuration of the modem interface, which is conventional, details of the same are omitted herein for the sake of brevity.

While the present invention has been described in connection with what is considered the most practical and preferred embodiment, it is understood that this invention is not limited to the disclosed embodiment but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

4

We claim:

**1.** A signal splitter comprising:

a first connecting port adapted to be coupled to an incoming telephone line and having first and second terminals;

a second connecting port adapted to be coupled to a telephony instrument and having first and second terminals;

a low-pass filter circuit having first and second input ends connected electrically and respectively to said first and second terminals of said first connecting port, and first and second output ends connected electrically and respectively to said first and second terminals of said second connecting port, said low-pass filter circuit being capable of permitting a low-frequency component of an incoming signal in the incoming telephone line to pass therethrough to said second connecting port; and

a coupling circuit including

a coupling transformer having a primary winding that interconnects said first terminal of said first connecting port and said first input end of said low-pass filter circuit, and a secondary winding that interconnects said second terminal of said second connecting port and said second output end of said low-pass filter circuit, and

a capacitor coupled between said first terminal of said first connecting port and said second terminal of said second connecting port,

whereby, said coupling circuit is operable to generate a coupling signal at said second connecting port to cancel a high-frequency noise signal induced by a high-frequency component of the incoming signal in the incoming telephone line upon said second connecting port.

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